

*Epidemiology of the Leptospiroses**

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The leptospiroses are primarily zoonoses, diseases communicable from animal to animal and from animal to man. Transmission from man to man is so infrequent as to be of no practical significance. Pathogenic leptospire are perpetuated in animal carriers from foci in the tubules of the kidney. Water, food, moist soil, and areas adjacent to animal and human habitations are contaminated by the urine of the leptospiral carriers. The degree of contamination is dependent upon the prevalence and numerical density of the animal carrier populations and their ecology. Although pathogenic leptospire are unable to perpetuate themselves indefinitely outside an animal host they may exist in moderately alkaline water or soil for several weeks.¹ Rodents, small carnivores and certain of the domestic animals are known reservoirs of infection. Each leptospiral serotype has a primary mammalian host species. A single animal species, however, may be the primary host of a number of serotypes of leptospire and may indeed be simultaneously infected with and shed two or more leptospiral serotypes.² In addition, the primary host of a single serotype may be one animal species in a given geographical area and another species in a different geographical area. Arthropods have been experimentally demonstrated to be capable of transmitting leptospire from one animal host to another.³ No naturally occurring arthropod transmission has yet been established. Infection of man results from direct or indirect contact with the contaminated urine of an animal carrier. Infections may occur through the mucous membranes or through minute cuts and abrasions of the skin. Penetration of intact skin has not been conclusively proved. The acidity of the stomach is sufficient to

destroy ingested leptospire. However, infection may take place through penetration of the buccal, pharyngeal and esophageal membranes.

Leptospire are found in milk during the acute systemic phase of the disease in lactating animals.⁴ They will survive in fluid raw milk for a number of hours and in diluted milk for a period of days.⁵ Leptospire are readily destroyed by ordinary pasteurization temperatures. No proved cases of milk-borne leptospirosis of man have been reported in the presently available world literature.

The establishment of renal carriers in the several animal species appears in general related to their position on the phylogenetic scale.⁶ Rodents and the small carnivores and marsupials appear to be almost commensurately related to leptospire in that virtually no disease is produced following infection and a lifelong renal carrier state is established. The domestic animals, on the other hand, are less well adapted to the organisms. Clinical disease is frequently encountered and the renal carrier state when established is usually of limited duration. For example, the duration of leptospiuria in cattle and horses appears to be in the order of four months. Man is only infrequently a leptospiral carrier and in these rare instances leptospiuria appears of very limited duration.

The leptospiroses of man may affect both sexes and all ages and occur in all seasons of the year. Most reports, however, describe disease occurring in young males during the warm, wet season. Leptospirosis is an occupational hazard to agricultural laborers, animal husbandrymen, veterinarians, sewer workers, refuse handlers, abattoir employees, and others exposed to rodent infested environments. In addition, large outbreaks may occur regardless of age or sex following swimming in contaminated waters.

Nine serotypes of leptospire are known to exist in North America.⁶ The available

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knowledge of their epidemiology is summarized in the following paragraphs:

L. icterohemorrhagiae is harbored primarily in rats, although mice, dogs and mongooses are significant reservoirs. Man may be infected by either direct or indirect contact with the urine of these animals, as in the case of the fishpacking plant employees working in a rodent infested area or the dog owner contracting infection from his pet.

Dogs are the primary reserve of *L. canicola* although swine and cattle have recently been found to be infected with this organism. The reported human infections have been limited to kennelmen, veterinarians and dog owners with the exception of one water-borne outbreak of approximately two dozen cases following swimming in a contaminated stream.⁷

L. pomona is harbored in swine, cattle, and horses in the United States and transmission of infection to man has followed direct contact with the urine of these animals as well as direct water-borne infection following swimming.⁸

Rats, mice and mongooses are the principal reservoirs of infection with a member of the *L. batavia* group. Only a single human infection in the United States has thus far been reported and the hosts in this country are not established.⁹

L. autumnalis, the etiologic agent of Fort Bragg fever has been recovered only from man in the United States.¹⁰ No epidemiological investigations have been conducted since its identification as a leptospire. The hosts and manner of infection of man are not established.

House mice, laboratory Swiss mice and wild-caught rats have been found to be infected with *L. ballum* in the United States but thus far no human infections from this area have been reported. Two naturally acquired human infections have been found in Puerto Rico but the means of infection were not determined.²

A member of the grippityphosa group has been isolated from man in Puerto Rico² and serologically demonstrated to infect man in the United States.¹¹ No animal reservoirs have yet been found.

A new serotype, alexi, of the pyrogenes group has been encountered in Puerto Rico in man and in rats which are the presumptive primary hosts.² This serotype has not yet been encountered in the United States.

Two serotypes of the hebdomadis group have been encountered in North America: one, a single infection of man in Puerto Rico for which the primary host is unknown,² and the other a widely prevalent infection of cattle in the United States.¹² No human infection with this serotype in the United States has yet been reported but its potential significance as a human pathogen cannot be discounted.

In investigations of the epidemiology of the leptospiroses in North America consideration should be taken not only of the identity of the infecting serotype and its probable primary host, but also of the possibility that future investigations may add to the list of known carriers of these organisms and thus complicate determination of the manner of human infection.

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